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# Baseline Assessment of the Elementary/Secondary Education Industry

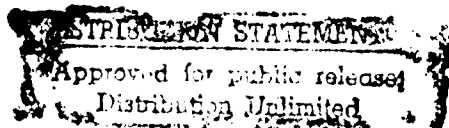
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ABSTRACT

**TITLE:** Baseline Assessment of the Elementary/Secondary Education Industry

**AUTHOR:** Hal R. Meyer

**PURPOSE:** To discuss the current status of the elementary/secondary sectors of the education industry to gain a better understanding of their operation including staffing, costs, and performance.

**INTENDED READERSHIP:** Those who have an interest in the structure, conduct, and performance of elementary/secondary education in the U.S.

**BRIEF SUMMARY:** Education is one of the largest industries in the United States. It is also an important industry because it provides the training for today's and tomorrow's workforce. Many businesses and universities believe that today's high school graduates do not have the basic skills in reading, writing, and mathematics to be productive workers. Furthermore, U.S. students do not compete well on international mathematics and science tests. After reviewing the structure and conduct of the elementary/secondary education industry, this paper provides examples of performance in math and science. Finally, it discusses some of the ongoing improvement efforts that give some hope for a better future.

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## INTRODUCTION.

Education is one of the largest industries in the United States. In 1990 the U.S. spent nearly \$360 billion on "formal" education -- elementary through graduate school. This equates to approximately 7% of gross national product.' When the costs of business training programs and other "informal" programs are included the U.S. spends over \$500 billion on education each year. Nearly one out of every three persons in the U.S. is involved in some sort of education as a student, trainee, teacher, or staff member.'

Besides being big business, education is an important industry! Michael Porter in The Competitive Advantage of Nations states, "Education/training constitute perhaps the single greatest long term leverage point available to all levels of government in upgrading industry. Improving the general education system is an essential priority of government, and a matter of economic and not just social policy." President Bush in announcing his national education strategy in April 1991 made an even stronger statement. "Today, education determines not just which students will succeed, but also which nations will thrive in a world united in pursuit of freedom of enterprise. ...Our greatest national resource lies within ourselves -- our intelligence, ingenuity -- the capacity of the human mind."'

This paper provides an economic baseline of the elementary and secondary portions of the education industry. The baseline begins with a definition of the education industry and shows where

the elementary and secondary sectors fit in. Then it describes elementary/secondary schools in terms of their structure -- the buyers and sellers; conduct -- policies and production practices; and performance -- a report card.

#### EDUCATION INDUSTRY DEFINED.

Industries are normally defined in terms of the buyers (customers), sellers (firms/businesses), and products. To do this in the education industry presents some unique challenges since most people don't think of education as an industry. For example, they don't view elementary schools as a "firm" producing something for sale. For purposes of this baseline, it is important to think of the different levels/types (i.e. elementary, secondary, college, or vocational) of education as the sectors of the industry. Each individual school or school district is a firm within a sector. Another ambiguity is the product -- knowledge, graduates, trained workers -- and how it is measured. The situation where many times the buyer isn't the recipient of the service causes additional confusion. The taxpayers, parents, or businesses often pay for the education while the student/trainee receives it.

This baseline focuses on two of these sectors: elementary and secondary schools. The Bureau of Census, U.S. Department of Commerce, collects economic data for both elementary and secondary schools under one combined Standard Information Code (SIC) 8211. The U.S. Department of Education's annual Digest of Education Statistics is another excellent source of information.

The following sectors, although part of the education

industry, are outside the scope of this baseline:

- colleges, universities, and professional schools -- SIC 8221\*
- junior colleges and technical institutes -- SIC 8222\*
- libraries -- SIC 823
- data processing schools -- SIC 8243
- business and secretarial schools -- SIC 8244
- vocational schools -- SIC 8249\*
- other specialized schools -- SIC 829

#### STRUCTURE OF THE EDUCATION INDUSTRY.

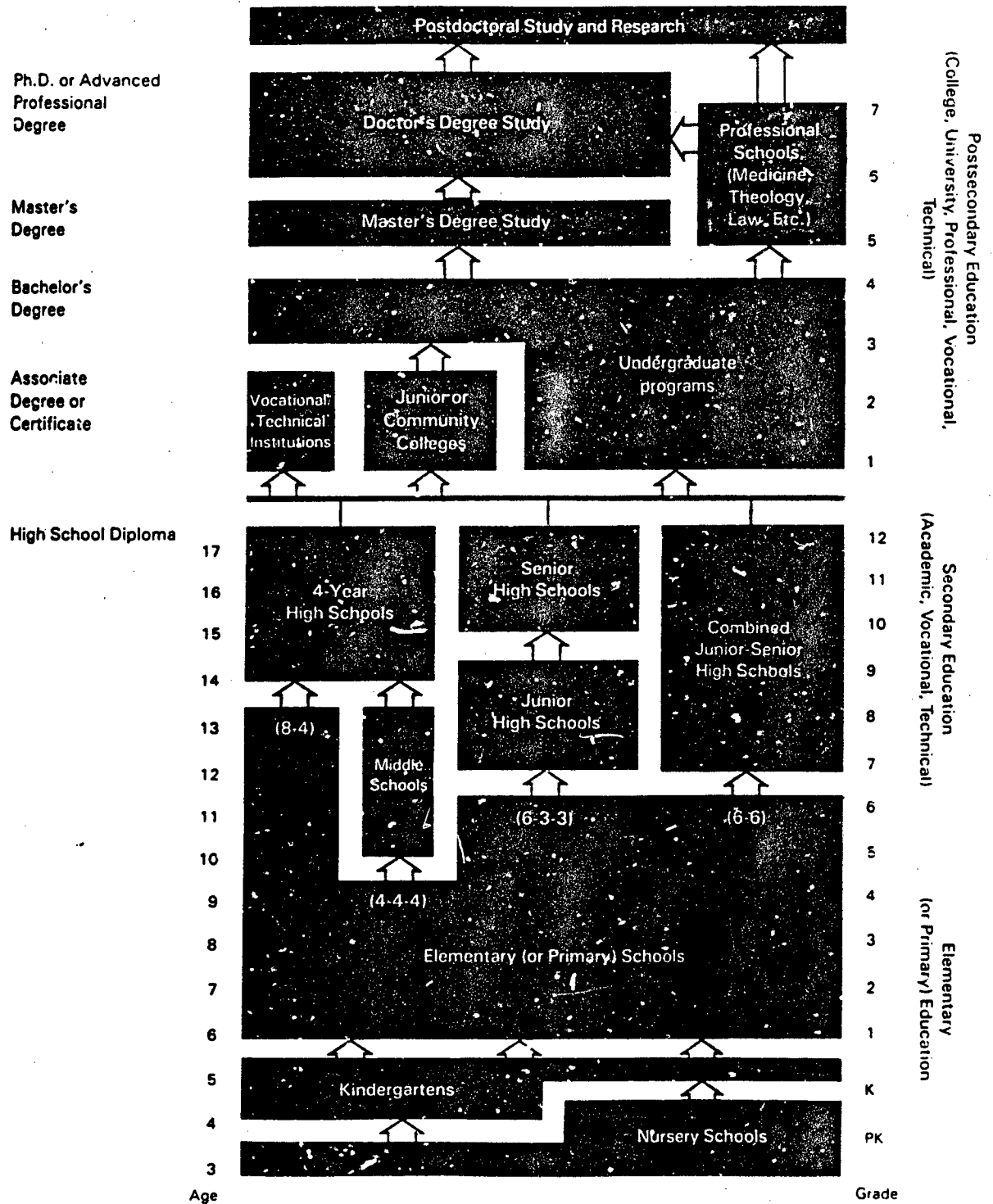
The structure of the education industry identifies and describes the sectors (i.e. the elementary and secondary schools) that provide education and the recipients of that education. Figure 1 (next page) shows the composition of the "formal" education system in the U.S.<sup>1</sup> Traditional elementary/secondary schools include kindergarten through the 12th grade. As shown in Figure 1, they can take many forms based on the number of years in elementary, junior high/middle school, and high school.

In 1990 there were slightly over 15,000 public elementary/secondary school districts as compared to 18,000 in 1970 and 83,000 in 1950.<sup>1</sup> These school district consolidations occurred for several reasons. Migration from rural to urban areas forced many smaller schools to consolidate just to maintain an adequate student base. School administrators pushed for efficiency and economy -- consolidation was their favorite solution. Finally, some state legislatures distributed funds based on local consolidation efforts.<sup>1</sup>

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<sup>1</sup>A complimentary baseline done by Donald Tison, Industrial College of the Armed Forces, Washington, DC, 1992, contains information concerning SICs 8221, 8222, and 8249.

Figure 1.—The structure of education in the United States



Age ranges for compulsory school attendance are set by the individual states. Of U.S. 5-17 year olds, 88.3% were in school during 1988. This is up from only 57% in 1970. Of 14-17 year-olds, 92.2% were enrolled in school'

Figure 2. Enrollment in public elementary and secondary schools.

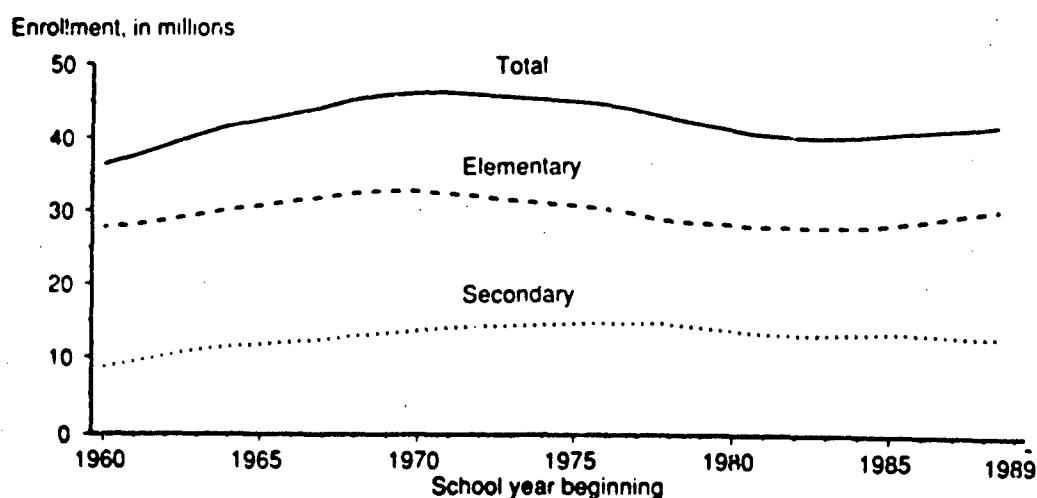


Figure 2 shows a 30-year history of enrollments for public schools.' Movement of the baby boomers through the system caused the rising trend through the 60's and the declines in the 70's. Their children are responsible for the rising trend in the 80-90's.

In 1989 there were 29,147,000 students in kindergarten through 8th grade and 11,461,000 in 9th through 12th grade for a total of 40,608,000 students in public schools. Public school enrollments are projected to continue to rise through 1998 peaking at over 44 million students -- an 8% increase.

In addition 5,355,000 students attended private schools in 1989: 4,162,000 elementary and 1,193,000 secondary." Historically, about 12 percent of U.S. students attend private

schools. This trend is expected to continue through 2001."

#### CONDUCT OF THE EDUCATION INDUSTRY.

The conduct of the education industry describes the policies and methods (factors of production) used to provide education for public consumption. It includes the costs incurred and the sources/amounts of revenues. It also includes the teachers/administrators who operate the local school systems.

In contrast to most other nations the U.S. has a very decentralized education system. The 10th Amendment to the Constitution, leaves responsibility for conduct of "formal" education in the U.S. with the states. Generally, most of this responsibility has been delegated down to the local school system which determines facilities, curriculum content and procedures, and expenditures.

With so much power vested at the local level, this equates to 15,000 localized monopolies. What school district a child attends is generally determined by the location of his/her residence. He/she has little choice other than moving to another district or attending a private school if one exists nearby and the parent(s) can afford to pay for it.

U.S. elementary/secondary schools are conducted under a basic philosophy of *an equal education for all according to their own abilities*. This means that in addition to a program designed for the masses, programs are needed for the handicapped, the economically/socially disadvantaged, and for the exceptionally talented. To do this requires increased human, physical, and

fiscal resources. It also leads to more oversight by government agencies.

#### EXPENDITURES.

Figure 3. Current expenditures for public elementary and secondary schools.

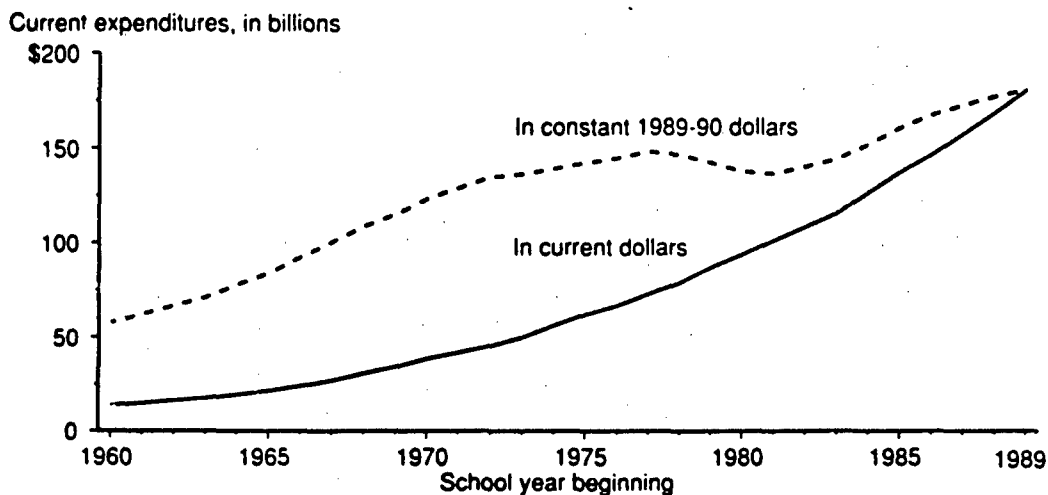


Figure 3 shows the climb in expenditures for public elementary and secondary education between 1960 and 1989." In 1989, current expenditures for these types of public education reached \$180 billion." Unless radical changes are made in the current education system, the combination of rising enrollments and the general rising trend in costs will ensure that the curve continues upward through 1998 and most likely well beyond. In fact, the U.S. Department of Education projects a 36% increase by 2001."

The average current expenditure per public elementary and secondary student in 1989 was nearly \$4500. After factoring out inflation this equates to a 28% rise since 1980. As discussed further in the "Teachers/Staff" section of this baseline, increases

in numbers of teachers/staff and salary increases are the primary causes. Looking at individual states, average expenditures range from lows of around \$2600 in Utah, Mississippi, and Alabama to highs of over \$7000 in New York and Alaska."

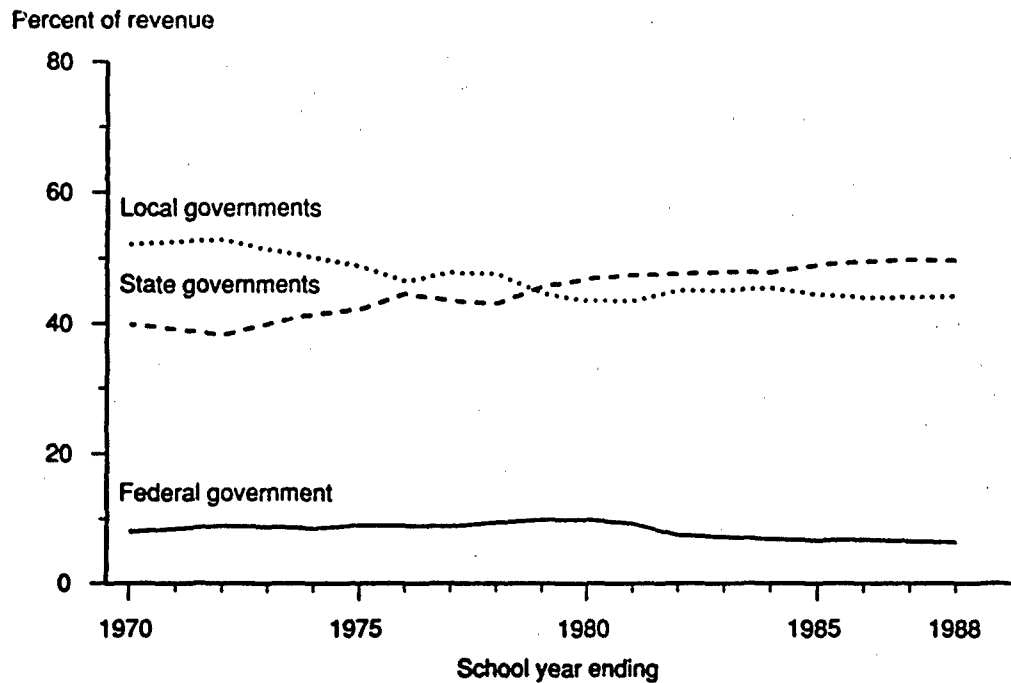
In 1989, tuition at private schools amounted to over \$8.6 billion." Total expenditures at private schools are higher, but neither the Department of Commerce, nor the Department of Education has complete data in this area -- they are seeking more data in the future. Although based on incomplete data, private schools have an average tuition of about \$1400 for elementary and \$2600 for secondary schools; however, the range is from \$1000 to over \$6000."

#### REVENUES.

As identified in Figure 4 (next page) local school systems get revenues from all three levels of government." The federal government provides about 6%, the states provide 50%, and 44% is provided locally." The percentages of revenue contributions roughly correlate to the amount of interest and policy input that each level of government has in education. With the current discussions over the poor quality of today's education, it will be interesting to see if these levels of support change radically.



**Figure 4. Sources of revenue for public elementary/secondary schools.**



**Figure 5. Federal funds for education, by agency: Fiscal year 1990.**

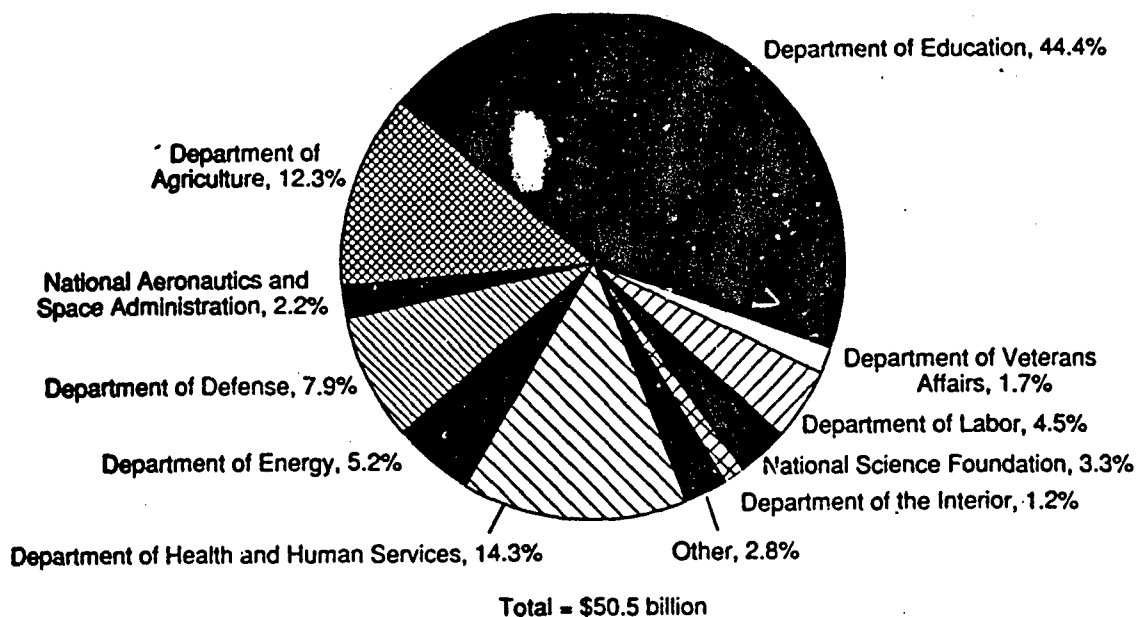


Figure 5 shows the diversity of sources within the federal government for support to all types/levels of education. It also highlights the difficulty in developing and administering a national education policy. Of the \$50.5 billion shown in Figure 5, \$21.1 billion was spent on elementary and secondary education."

TEACHERS/STAFF.

School administrators (principals and superintendents) are responsible for the daily operation of the schools. Together with the teachers and other support personnel, they implement the curriculum and carry out the school's policies. In 1988 there were 103,000 administrators in elementary/secondary schools. Of these over 90% were white as compared to a white enrollment of 70%. Nearly 75% are male in contrast to 70% of the teachers being female."

In 1988 there were 2,320,000 public and 350,000 private elementary/secondary school teachers in the U.S." An average teacher would have the following characteristics:

- she (70%) would be white (90%), 41 years old, and married.
- she would have a masters degree and 15 years of experience.
- she spends at least 7 hours at school 185 days a year.
- her average work week is 49 hours long.
- her average class size is 24 students.
- there is a 69% chance that she is willing to teach again."

The average public school teacher in 1990 earned \$31,304. After removing inflation, this equals a 21% increase since 1981." However, the average 1990 starting salary (constant 1990 dollars) of \$22,427 was slightly less than the 1974 starting salary." For comparison purposes, private school teachers make \$8-10,000 less each year." Despite recent increases, teachers are paid less than other professionals with comparable education/experience levels.

Teacher certification is administered at the state level while recruiting and hiring are done at the local level. With the so-called decay of education, teacher qualification is receiving increased scrutiny.

Virtually, all (99.4%) public elementary/secondary teachers have at least a bachelors degree and 47% have masters or higher degrees. Additionally, only 8% of these teachers have less than 3 years experience, while 66% have over 10 years experience and 21% have over 20 years experience. In private schools 4.4% have less than four years of college and 18% have less than 3 years experience.

However, what is disconcerting is the fact that over 20% of all teachers are teaching subjects that they are unqualified to teach." Furthermore, public secondary math and science teachers have the least qualifications when compared to teachers in other subject areas. Math and science teachers ranked the lowest in all the following categories: (numbers in parentheses are for all categories of teachers)

- certified to teach in primary field assigned - 91.8% (93.3%)
- majored/minored in primary field assigned - 71.9% (80.2%)
- certified to teach in secondary field assigned - 65.3% (66.7%)
- majored/minored in secondary field assigned - 44.3% (50.7%)."

A 1986 study comparing teacher qualifications to standards recommended by the National Science Teachers Association and the National Council of Teachers of Mathematics, found that very few teachers met all the standards: in science, only 34% of elementary, 22% of 7-9th, and 12-31% of high school teachers dependent upon subject taught -- physics, chemistry, biology; and in mathematics, 18% of elementary, 14% of 7-9th, and 15% of high school."

Another area that is frequently touted as having direct impact on teacher effectiveness is the pupil to teacher ratio. Since 1955 the pupil to teacher ratio has declined steadily from 27 to 17:1 in public schools and from 32 to 14:1 in private schools."

In 1988 the non-teaching staff -- administrators, aides, counselors, secretarial and support staff -- numbered nearly 2,230,000. This is almost a one to one ratio of teachers to staff. Since 1970 the ratio of students to non-teaching staff dropped from 13.5 students per staff member to just over 9 students per staff member."

### PERFORMANCE OF THE EDUCATION INDUSTRY.

As in any industry it is performance that counts. Perhaps it is justice that the nation give the education industry a report card. Performance is measured in terms of opinions of employers concerning quality of employees, achievement on standardized tests compared over time and compared to students in other countries, and high school completion rates. Because of their direct and significant impact on most other industries and the U.S.'s future technological leadership, science and mathematics education will receive special emphasis.

### REPORT CARD.

Unfortunately, the great majority of the report card is negative. According to former Secretary of Labor William Brock, "we have public education at the elementary and secondary level that ranks below every industrial competitor we have in the world." A 1989 national poll of college professors found 75% of undergraduates "seriously underprepared in basic skills." "Many American workers--20 percent or more in some firms--are deficient in basic skills (reading, writing, arithmetic, and communication)." Even the Economic Report of the President to Congress in 1991 highlights the decay in education. Firms are spending \$20 billion annually on remedial reading and mathematics programs and the number of colleges offering remedial instruction for freshmen has increased from 79% in 1980 to over 90% today." Collectively, this paints a really bad picture; how do math and science stack up individually?

### MATHEMATICS.

As identified in the previous paragraph, "the mathematical skills of our nation's children are generally insufficient to cope with either on-the-job demands for problem solving or college expectations for mathematical literacy. Nearly half of today's graduates have math skills that peak out with simple problem solving using whole numbers." "Fewer than one out of five students in Grades 4, 8, and 12 has reached the National Education Goal of demonstrating competency in mathematics." Furthermore, Figures 6 and 7 are typical examples of how students in other countries are far out-performing U.S. students on achievement tests.

Figure 6. Mathematics achievement in five countries, 1988." Percent of 13 year-olds scoring at or above five levels.

COUNTRY	LEVEL 300	LEVEL 400	LEVEL 500	LEVEL 600	LEVEL 700
Ireland	98 %	86 %	55 %	14 %	< 1 %
Korea	100 %	95 %	78 %	40 %	5 %
Spain	99 %	91 %	57 %	14 %	1 %
United Kingdom	98 %	87 %	55 %	18 %	2 %
United States	97 %	78 %	40 %	9 %	1 %

Level 300: Can +/- two-digit numbers and solve simple number sentences.

Level 400: Can solve one-step problems; understands the most basic ideas.

Level 500: Can solve two-step problems; convert fractions, decimals, percents.

Level 600: Can multiply fractions and decimals; understands measurements.

Level 700: Can use data from a complex table to solve problems and apply skills to new situations.

Figure 7. Student achievement by subject area (U.S. 12th grade)"

<u>GEOMETRY</u>	<u>ADVANCED ALGEBRA</u>	<u>FUNCTIONS/CALCULUS</u>
1. Hong Kong	1. Hong Kong	1. Hong Kong
2. Japan	2. Japan	2. Japan
3. England	3. Finland	3. England
4. Sweden	4. England	4. Finland
5. Finland	5. Flem. Belgium	5. Sweden
6. New Zealand	6. Israel	6. New Zealand
7. Flem. Belgium	7. Sweden	7. Flem. Belgium
8. Scotland	8. Ontario	8. Ontario
9. Ontario	9. New Zealand	9. Israel
10. French Belgium	10. French Belgium	10. French Belgium
11. Israel	11. Scotland	11. Scotland
12. <u>United States</u>	12. Brit. Columbia	12. <u>United States</u>
13. Hungary	13. Hungary	13. Thailand
14. Brit. Columbia	14. <u>United States</u>	14. Hungary
15. Thailand	15. Thailand	15. Brit. Columbia

Some people argue that international comparisons of achievement are invalid due to incompatibilities in test group samples and societal biases. Despite the potential biases, Diane S. Ravitch, Assistant Secretary for Educational Research and Improvement, supports continued international testing and believes the results are valuable."

Despite all the negatives, there are some positive factors in mathematics education. "In 1990, average mathematics proficiency for students 9, 13, and 17 years old was at its highest level in twelve years." The percent of students completing algebra I/II and geometry increased from 22 to 35% between 1982-1987." Similarly, the average number of high school math courses taken between 1982-1987 rose from 2.5 to 3.0 per student." After dropping throughout the 70's, Scholastic Aptitude Test (SAT) scores in mathematics rose slightly through the 80's -- 466 (1980) to 476 (1990). Hopefully, the drop in 1991 scores (474 average) is not a precursor to another decade of decline.

#### SCIENCE.

The grade for science isn't any better. According to a recent survey only 5% of the American public is scientifically literate, down from 7% in 1979." Figure 8 (next page) shows how U.S. students compare to those in other countries."

On the positive side, the average number of science courses taken between 1982-1987 rose from 2.2 to 2.6 per student." Similarly, the percentage of students taking biology, chemistry, and physics rose from 11 to 17% between 1978-1990. Furthermore, the 1990 average science proficiency scores for 9 and 13 year-olds increased slightly from 1977-1990. Average scores for 17 year-olds rose during the late 80's with the 1990 average equaling the 1977 average."



Figure 8. Results of science achievement tests sponsored by International Association for the Evaluation of Educational Achievement, 1988.

Rank Order of Countries for Achievement at Each Level

	10 Yr Old Grade 4/5	14 Yr Old Grade 8/9	Grade 12/13 Biology	Science Students Chemistry	Physics
Australia	9	10	9	6	8
Canada	6	4	11	12	11
England	12	11	2	2	2
Finland	3	5	7	13	12
Hong Kong	13	16	5	1	1
Hungary	5	1	3	5	3
Italy	7	11	12	10	13
Japan	1	2	10	4	4
Korea	1	7	-	-	-
Netherlands	-	3	-	-	-
Norway	10	9	6	8	6
Philippines	15	17	-	-	-
Poland	11	7	4	7	7
Singapore	13	14	1	3	5
Sweden	4	6	8	9	10
Thailand	-	14	-	-	-
U.S.A.	8	14	13	11	9
Total	—	—	—	—	—
Countries	15	17	13	13	13

HIGH SCHOOL COMPLETION RATES.

Before leaving the performance area we need to look at how schools do in keeping their students through graduation. "In 1989, the completion rate was 81.1 percent for 19-year-olds, 86.5 percent for 24-year-olds, and 86.9 percent for 29-year-olds." Completion rates for minorities are lower with the Hispanic rate falling below 60 percent for all three age groups. Rates are also lower for males than females and lower in the inner cities, sometimes falling below 50 percent.

### CLOSING COMMENTS.

This completes the baseline look at the elementary/secondary sectors of the education industry -- its structure, conduct, and performance. The following paragraphs contain on-going improvement efforts -- reasons for hope -- and my personal observations.

### EDUCATIONAL IMPROVEMENT EFFORTS.

As the performance section showed, elementary/secondary schools are not living up to expectations. Several ongoing improvement efforts deserve discussion. Some are government actions, some are private efforts, and some combinations of both.

In 1983 several of the nation's governors served on the National Commission on Excellence in Education. Their report, A Nation at Risk, outlined the dismal state of US elementary/secondary education. Since then the governors have continued to study education problems in search of answers.

Furthermore, in 1991 President Bush and the nation's governors announced their national education strategy called "America 2000." It includes six goals to be achieved by the year 2000:

1. All children in America will start school ready to learn.
2. The high school graduation rate will increase to at least 90%.
3. American students will leave grades 4, 8, and 12 having demonstrated competency in English, mathematics, science, history, and geography.
4. U.S. students will be first in the world in science and mathematics achievement.
5. Every adult will be literate.
6. Every school will be free of drugs and violence.

One of the brightest rays of hope is work being done entirely by the National Council of Teachers of Mathematics. In 1989 they published Curriculum and Evaluation Standards for School Mathematics which redefines the mathematical needs of today's and tomorrow's students to enhance success in the technology and information age of the 21st century. A companion document, Professional Standards for Teaching Mathematics, published in 1991, carries an overarching goal of "equal access to a quality mathematics education for every student."

Also, in September 1991 the National Research Council, part of the National Academy of Sciences, received a \$500,000 grant from the U.S. Department of Education to develop curriculum and teaching standards for science similar to those in math. Likewise, the Department of Education recommends that other disciplines complete similar curriculum and teaching reviews and will provide funding to support those efforts.

In tomorrow's technological society, computer literacy will be essential -- many people feel it already is. As a nation we are making progress and the schools are leading the way. The percent of students that use computers in school has risen from 29% in 1984 to 46% in 1989. In addition 28% of the students have access to computers at home."

Finally, extraordinary individual efforts are being publicized and rewarded. For example the success of Jaime Escalante has been portrayed in the movie, "Stand and Deliver." He turned an impoverished, Hispanic Los Angeles school into a national math

powerhouse. His key to success: "Determination + Hard Work + Discipline = The Way to Success." He believed that students don't learn if they don't study. It's up to the schools, the teachers, and the parents to set the standards and encourage the students to meet them." He now spends his time teaching other teachers how to help their own students become successful.

#### OBSERVATIONS.

In seeking solutions for improving today's education, we as a nation either don't understand or choose not to include all the players in a *complete education system*. We constantly point a finger at the public school system and complain about how poorly it is doing. Although it shares the blame, it is not alone. The U.S. *education system* begins with the federal, state, and local government bodies. It includes the school board, administrators, and teachers. It includes the parents and the students. It includes all the businesses that need to provide post-employment training for its workers. Finally, it includes all the taxpayers. Each and every group has a stake and a role in making our *education system* successful and thereby enhancing the security of the U.S.

During my studies and visits to several school systems -- both those doing very well and those trying to pull out of the depths of despair -- around the United States, several common themes point toward success. Involvement of the parent(s) is critical. Parents are expected to be partners in the education process. This partnership then expands to include the entire community, especially businesses. A strong local administration is required.

This includes both the responsibility and the authority to make decisions at the local level. The school and the community need to teach a value system including respect for authority, discipline, and the importance of education. Finally, but not leastly, the students need to be motivated to learn. Again everyone in the education system has a role in fostering the proper motivation.

CLOSING.

As I stated in the introduction, education is big business and it is an important business. It provides the workers for all other industries. Today's global and technological economy makes education even more important. Some of our competitors have known this for some time as the U.S. Department of Education concluded following its 1987 study of Japanese education.

"In Japan, the relationship between education and the economy appears to be closer and more effective than in most other industrialized nations. Japan does an effective job of providing a flexible and productive labor force for its economy, in large part because of the pivotal roles played by a high level of basic education, disciplined work habits, and group cohesiveness -- all school based or fostered. Indeed, the remarkable performance of the Japanese economy over the past 25 years provides compelling testimony to the fundamental contributions that education can make to national development and international competition."

The United States should expect no less of its education industry!

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